Claims

What is claimed is:

1. An apparatus for use in a heat exchanger system comprising:

an outer tube,

an inner tube extending through the outer tube so as to form an interstitial space between the inner tube and the outer tube; and

a ridge located in the interstitial space and contacting the inner tube and the outer tube so as to form a fluid passageway through the interstitial space.

2. The apparatus of claim 1 wherein the inner tube extends through at least the entire length of the outer tube.

3. The apparatus of claim 1 wherein the ridge extends at least the entire length of the interstitial space.

4. The apparatus of claim 1 wherein the ridge is helical in shape.

5. The apparatus of claim 4 further comprising a second helical ridge located in the interstitial space and contacting the inner tube and the outer tube so as to form a second fluid passageway through the interstitial space.

6. The apparatus of claim 1 wherein the ridge is formed into an outside surface of the inner tube.

7. The apparatus of claim 1 wherein the ridge is formed into an inside surface of the outer tube.

8. The apparatus of claim 1 wherein the outer tube is constructed of a metal.

9. The apparatus of claim 1 wherein the inner tube is constructed of a metal.

10. The apparatus of claim 1 wherein the ridges is constructed of a metal.

11. A heat exchanger system comprising:

a shell forming a chamber;

an inner tube positioned within the chamber;

an outer tube surrounding at least a portion of the inner tube so as to form an interstitial space between the inner tube and the outer tube;

a ridge located in the interstitial space and contacting the inner tube and the outer tube so as to form a fluid passageway through the interstitial space;

the shell having openings for supplying and discharging a tubeside fluid through the inner tubes;

the shell having openings for supplying and discharging an inert fluid to the interstitial space; and

the shell having openings for supplying and discharging a shellside fluid through the chamber so that the shellside fluid contacts an outside surface of the outer tube.

12. The system of claim 11 further comprising means to supply the inert fluid through the interstitial space at a pressure higher than pressures of the tubeside fluid and the shellside fluid.

13. The system of claim 12 further comprising means to detect pressure within the interstitial space.

14. The system of claim 13 further comprising a controller coupled to the pressure detection means, the controller programmed to trigger an alarm upon receiving a pressure drop signal from the pressure detection means.

15. The system of claim 11 further comprising outer tube sheets for supporting the inner tube within the chamber, the outer tube sheets located in the chamber of the shell so as to allow only the tubeside fluid to flow into the inner tube.

16. The system of claim 15 further comprising inner tube sheets for supporting the outer tube, the inner tube sheets located in the chamber between the outer tube sheets and positioned so as to allow only the inert fluid to flow into the interstitial space.

17. The system of claim 16 further comprising a plurality of baffles located in the shell chamber between the inner tube sheets.

18. The system of claim 11 wherein the inner tube extends through at least the entire length of the outer tube.

19. The system of claim 11 wherein the ridge extends at least the entire length of the interstitial space.

20. The system of claim 11 wherein the ridge is helical in shape.

21. The system of claim 20 further comprising a second helical ridge located in the interstitial space and contacting the inner tube and the outer tube so as to form a second fluid passageway through the interstitial space.

22. The system of claim 11 wherein the ridge is formed into an outside surface of the inner tube.

23. The system of claim 11 wherein the ridge is formed into an inside surface of the outer tube.

24. The system of claim 11 comprising a plurality of the outer tubes, each outer tube surrounding at least a portion of an inner tube so as to form an interstitial space between each inner tube and each outer tube, and a ridge located in each interstitial space that contacts the respective inner tube and outer tube so as to form fluid passageways through each respective interstitial space.

25. A method of cooling or heating fluids comprising:

providing an apparatus comprising an outer tube, an inner tube extending through the outer tube so as to form an interstitial space, and a ridge located in the interstitial space and contacting the inner tube and the outer tube so as to form a fluid passageway through the interstitial space;

flowing a tubeside fluid through the inner tube;

supplying an inert fluid to the interstitial space; and

flowing a shellside fluid over an outside surface of the outer tube.

26. The method of claim 25 wherein the ridge is helical in shape and extends along at least the entire interstitial space.

27. The method of claim 25 wherein the inert fluid is flowing through the passageway of the interstitial space at a pressure higher than pressures of the tubeside fluid and the shellside fluid.

28. The method of claim 27 further comprising the step of monitoring the pressure of the inert fluid for a pressure drop.

29. The method of claim 28 further comprising the step of upon detecting a pressure drop, signaling the pressure drop to an operator or control system.

30. The method of claim 25 wherein the ridge is formed into an outside surface of the inner tube.

31. The method of claim 25 wherein the ridge is formed into an inside surface of the outer tube.

32. The method of claim 25 wherein the inert fluid is non-reactive with the shellside fluid and the tubeside fluid.